WATER MANAGEMENT & WASTE WATER TREATMENT IN EGNATIA ODOS MOTORWAY

Thalia Valkouma
Biologist, MSc Environmentalist, MBA
Head of Environmental Dpt.
Egnatia Odos S.A.

ΕΓΝΑΤΙΑ ΟΔΟΣ Α.Ε.

IWWATV Industrial Waste & Wastewater Treatment & Valorisation

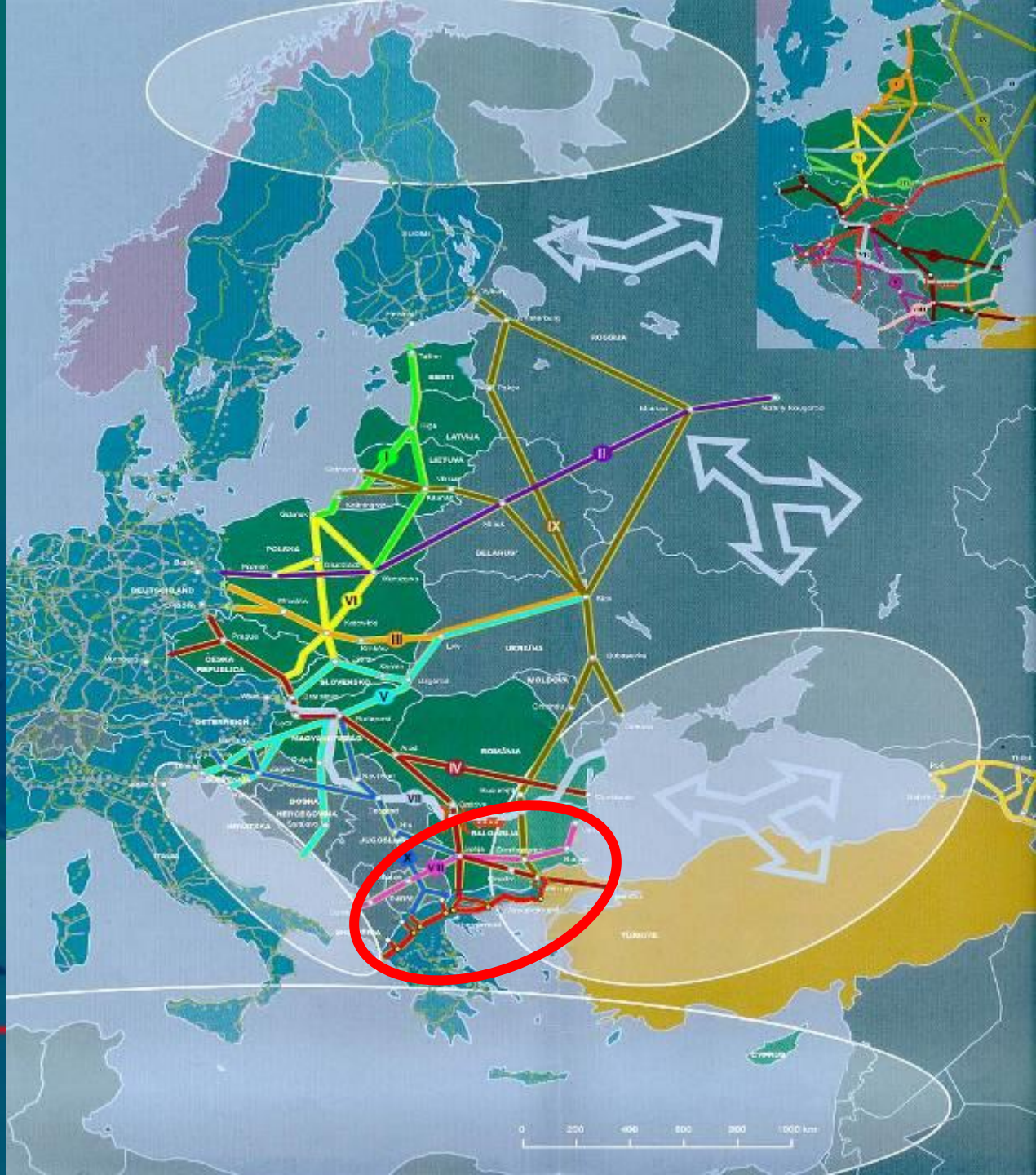
EGNATIA ODOS S.A. – THE COMPANY

- **EGNATIA ODOS S.A was established in 1994**
- **Responsible for the design, construction, maintenance, exploitation and management of one of the most complex and ambitious infrastructure projects**
- **Highly qualified professional staff**
- **Innovations in the management and administration of public works projects**
- **Complete and efficient environmental strategy with respect to national resources and the implementation of advanced technologies**

EGNATIA MOTORWAY

&

THE TRANS EUROPEAN TRANSPORT NETWORK



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THE EGNATIA MOTORWAY PROJECT

1000 km of motorway

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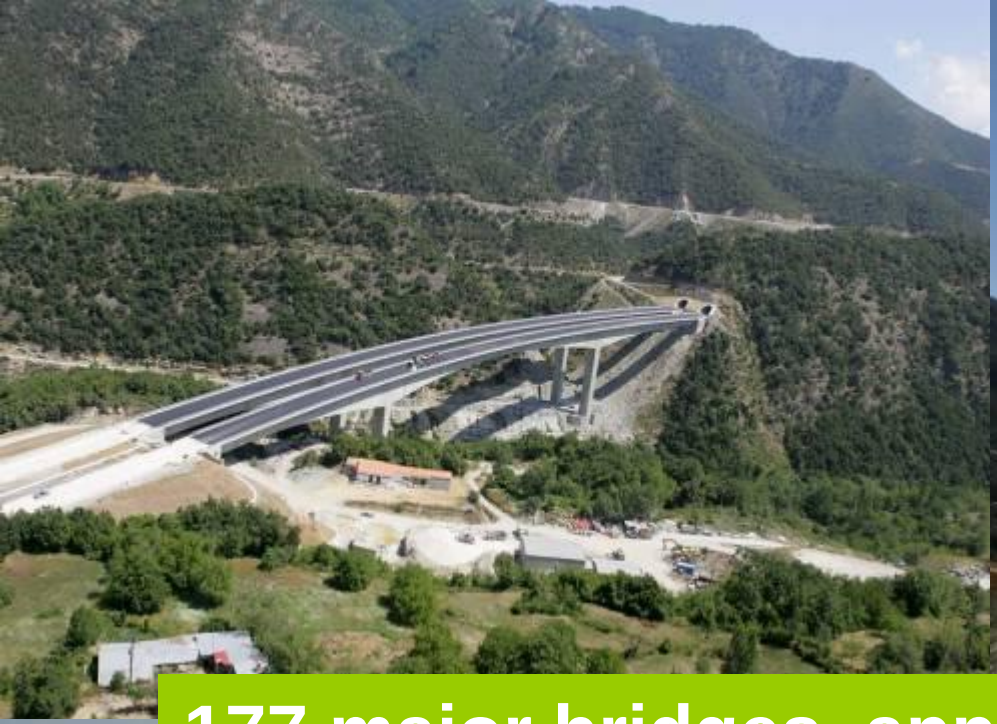
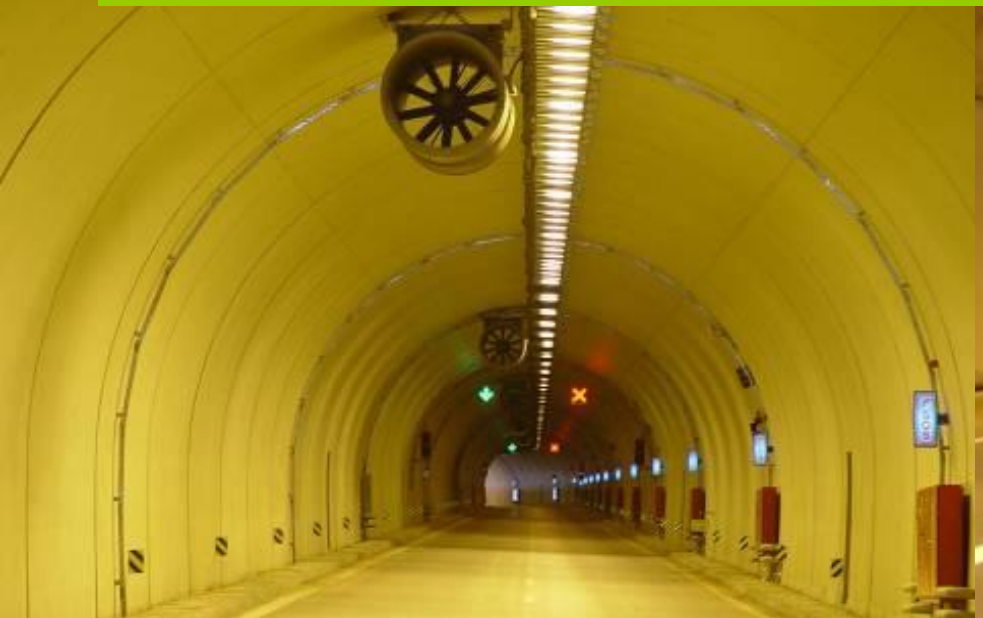
THE IDENTITY OF EGNATIA MOTORWAY

AXIS LENGTH:	670 km (From Igoumenitsa to Kipi)
TECHNICAL FEATURES:	Dual carriageway of international standards with two traffic lanes per direction, a central reserve and an emergency lane
INTERCHANGES:	63
ENTRANCE/EXIT OVERBRIDGES & UNDERPASSES:	350
MAGOR BRIDGES:	177 with a total length of 40 km and many smaller ones
TUNNELS:	73 twin-bore up to 4,8 km long, with a total length of 50 km
RIVER CROSSINGS:	43
PROPOSING AND FINANCING:	Archaelogical excavations, protection of monuments, environmental protection works



177 major bridges, approximately 40 km long

73 twin-bore tunnels of 50km length
(100km measured as single-carriageway ones)



63 ROAD INTERCHANGES

ACCESS TO PORTS


PREVENTING WATER POLLUTION
PROTECTING ECOSYSTEMS
MONITORING WATER POLLUTION
Environmental Protection / Sustainability
LIMITING ENERGY CONSUMPTION
MONITORING AIR POLLUTION
MONITORING ROAD TRAFFIC NOISE

Monitoring and Management of Water Pollution

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DEGREDATION OF WATER QUALITY DUE TO MOTORWAYS

WATER POLLUTION CONTROL IN EGNATIA MOTORWAY

Water Monitoring

Prevention of Water Pollution

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WATER MONITORING

Sampling & Analyzing of Water

- Water bodies in the vicinity of the motorway
- Sensitive Ecosystems
- Areas influenced also by other polluting sources

WATER MONITORING

	Parameters	Unit	Analysis Method
Fats - Oils	Fats & Oils	mg/L	
Physico-chemical analyses	Temperature	° C	
	pH	4-10	APHA-AWWA-WEF, 2005-4500H$^+$b
	Conductivity	μS/cm	APHA-AWWA-WEF, 2005-2510b
	Salinity	ppt	APHA-AWWA-WEF, 2005-2520b
	Turbidity	NTU	(2130, APHA AWWA WEF, 2005)
	Total hardness	French degrees	
Organic Load	BOD_5	mg/l	APHA-AWWA-WEF, 2005-5210b
	COD	mg/l	APHA-AWWA-WEF, 2005-5220c
	TOC	mg/l	(5310B, APHA AWWA WEF, 2005).
	Dissolved Oxygen (DO)	mg/l	(APHA AWWA WEF, 2005).

WATER MONITORING

Solids	TSS (Total Suspended Solids)	mg/l	APHA-AWWA-WEF, 2005-2540d
	TDS (Total Dissolved Solids)	mg/l	APHA-AWWA-WEF, 2005-2540c
Nutrient ions	NO_3^-	mg/l	APHA-AWWA-WEF, 2005-4500b
	NO_2^-	mg/l	
	PO_4^{3-}	mg/l	
	NH_4^+	mg/l	
	SO_4^{3-}	mg/l	
	F^-	mg/l	
	Cl^-	mg/l	
	Br^-	mg/l	
	Na^+	mg/l	
	K^+	mg/l	
	Ca^{2+}	mg/l	
	Mg^{2+}	mg/l	

WATER MONITORING

Metals	Pb	mg/l, μg/l	APHA-AWWA-WEF, 2005-3111b,d
	Cd	mg/l, μg/l	
	Fe	mg/l, μg/l	
	As	mg/l, μg/l	

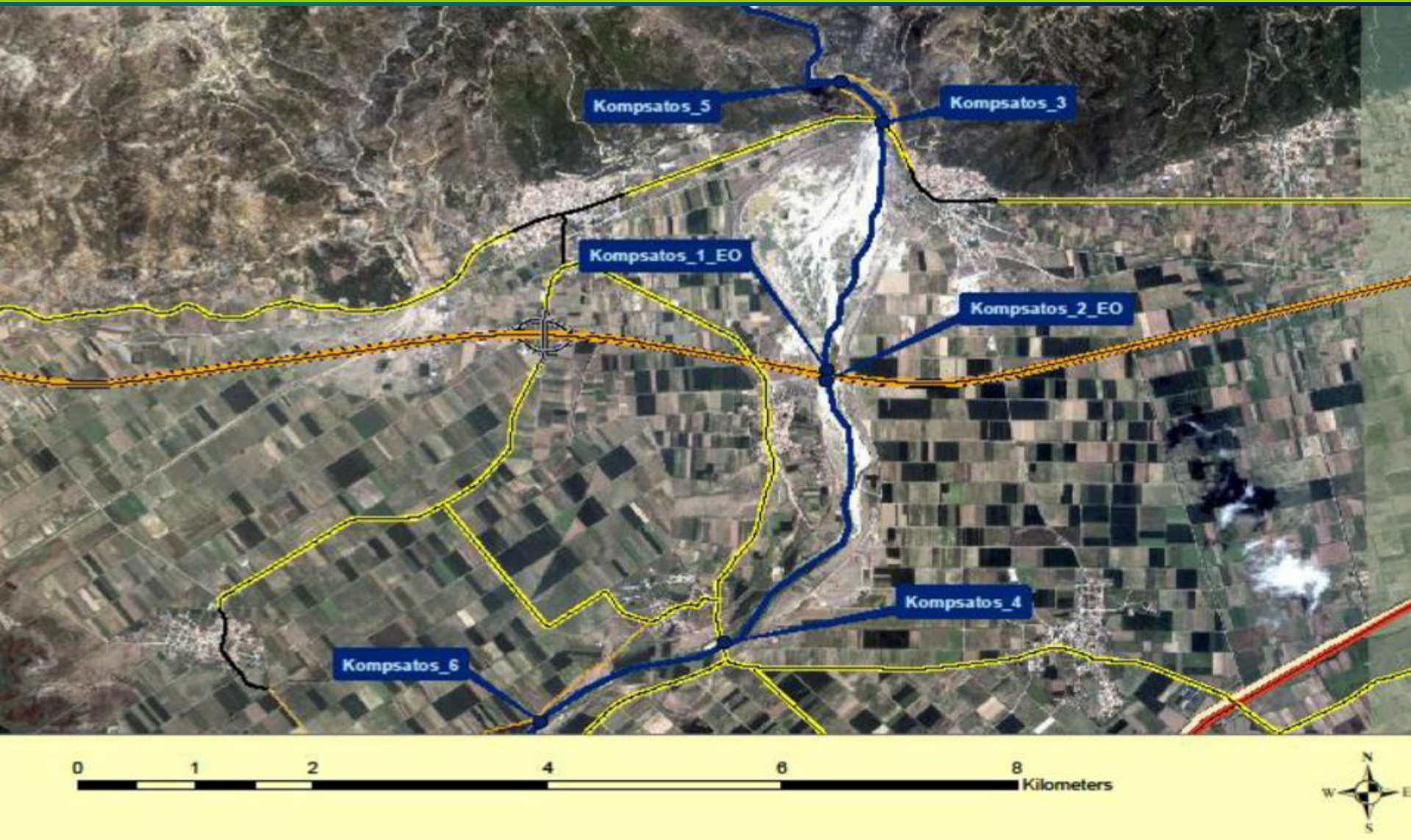
Samplings are carried out by qualified personnel under ISO 5667

Analyses are carried out in chemical laboratories accredited by National Accreditation Council (ESYD) according to ISO 17025: 2005

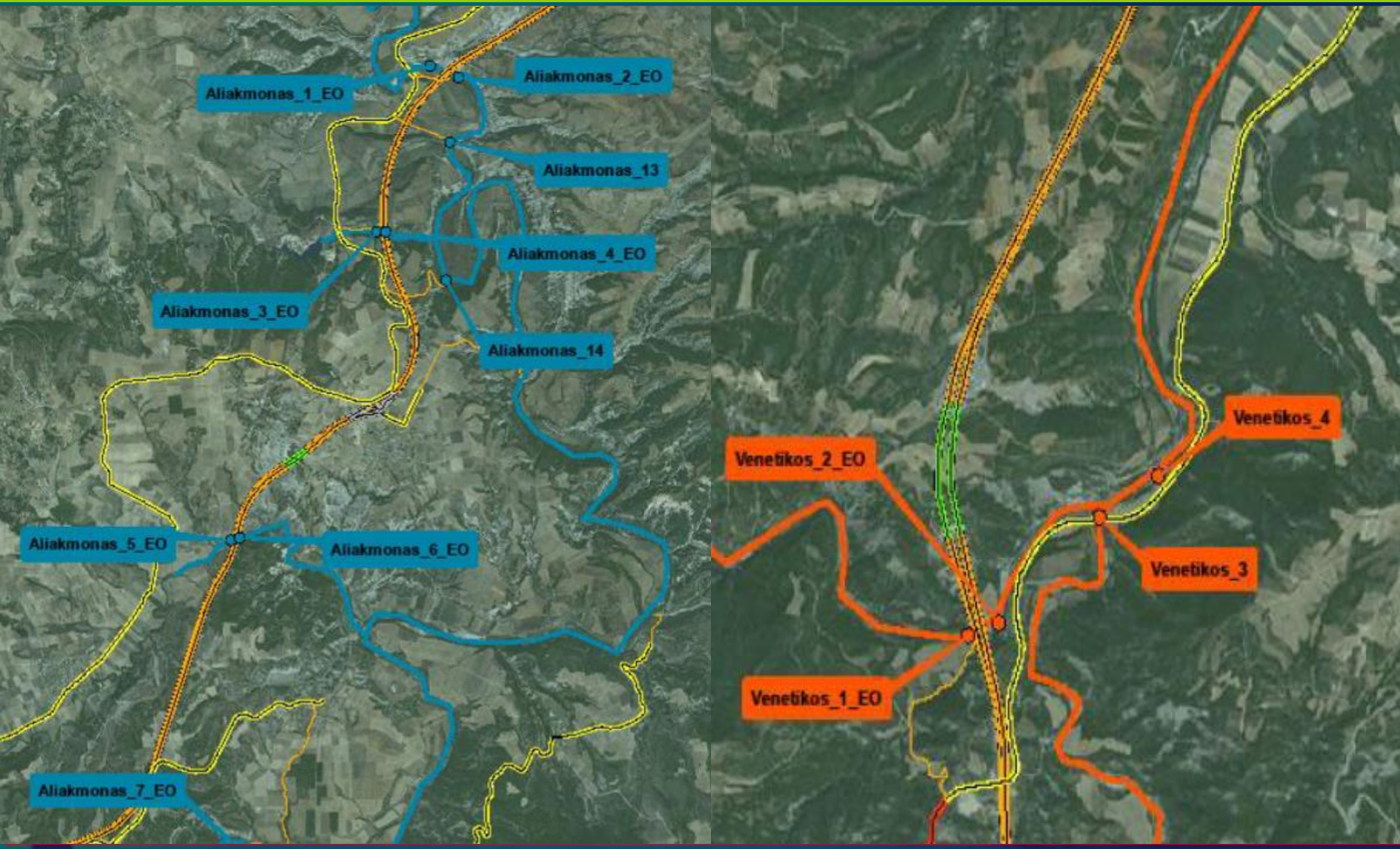
Results of the analyses are correlated with factors such as climatic data, motorway's technical characteristics, traffic volumes, rainfall, topography, other polluting sources and geological data

All data are registered in data bases for statistical and geo-spatial analysis

WATER MONITORING



WATER MONITORING



PREVENTION OF WATER POLLUTION

Water Pollution is caused by:

- pollutants collected on the road surface over time and washed off and transported during rainfall events
- accidental spillage of material (dangerous or not) on the motorway.

PREVENTION OF WATER POLLUTION

Pollution Control Units (PCUs): hydrocarbon seperators that minimize the motorway's impact on the water environment

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PREVENTION OF WATER POLLUTION

Operation & Maintenance of Pollution Control Units (PCUs)

PREVENTION OF WATER POLLUTION

Operation & Maintenance of Pollution Control Units (PCUs)

WASTE COLLECTED

130508* (waste mixtures of chambers debris and oil/water separators)

160708* (waste containing oil)

130502* (sludges from oil/water)

PREVENTION OF WATER POLLUTION

Operation & Maintenance of Pollution Control Units (PCUs)

The management stages of the hazardous waste collected from the PCUs of Egnatia motorway are the following:

- **Collection of wastewater in tank trucks.**
- **Collection of mud residues in UN type barrels which are transferred by closed vehicles at the premises of the company responsible for their management.**
- **Transfer of liquid waste into storage tanks at the premises of the company responsible for temporary storage.**
- **Uploading of liquid waste from the tanks and transfer by tankers or trucks at the premises of the company responsible for their management.**

PREVENTION OF WATER POLLUTION

Operation & Maintenance of Pollution Control Units (PCUs)

PREVENTION OF WATER POLLUTION

Waste Management

The final disposal and management of liquid waste is the following (under the disposal & recovery codes D9-D7-R3-R13

a) Separating water from oil by physical flotation
b) Aggregation - Flocculation
c) Dissolved air flotation
d) Biological treatment

For the final disposal and management of sludge, bioremediation of contaminated soils and organic wastes is applied, through disposal D8

Regarding waste oil from separators the overall waste treatment is carried out in four stages (under recovery code R9):

a) Receipt and storage
b) Dehydration
c) Rectifying
d) Refining

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RESULTS

Water Monitoring

Analyses of the samples, have revealed that almost all values of measured parameters are within limits according to the Greek legislation relating to water intended for irrigation, and according to the law on water parameters features intended for human consumption.

Besides, the results of the analyses do not show strong differences between the sampling periods and also between uprstream and downstream samplings in the same water body.

WATER MANAGEMENT & WASTE WATER TREATMENT IN EGNATIA ODOS MOTORWAY
RESULTS

Prevention of Water Pollution

Type of hazardous waste	Quantity (Kg)	Code no (European Waste list)
SLUDGE	2.120	130502
WASTE CONTAINING OIL	515.600	160708
WASTE MIXTURES OF CHAMBERS DEBRIS & OIL/WATER SEPERATORS	13.000	130508

WATER MANAGEMENT & WASTE WATER TREATMENT IN EGNATIA ODOS MOTORWAY

CONCLUSIONS

* Effects on water quality of water bodies from runoff water from motorways can be minimized by combining best management techniques, such as monitoring the water quality of both runoff and water bodies at the vicinity of the motorway and also by constructing and operating Pollution Control Units to lessen effects of motorway runoff on the water quality of receiving water bodies.

* The operation and maintenance of the PCUs is of highly importance, it is closely connected with water quality of adjacent receivers and it may present various types of hazards, requiring, at least, as a typical or particular workplace, performance of a risk assessment, definition of safe work practices, use of proper PPE and workers' training.

* Contingency plans shall exist in case of accident and discharge of toxic loads in the motorway and certain specifications must be followed for the assessment and management of cumulative impacts on water bodies.

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THANK YOU FOR YOUR ATTENTION !

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